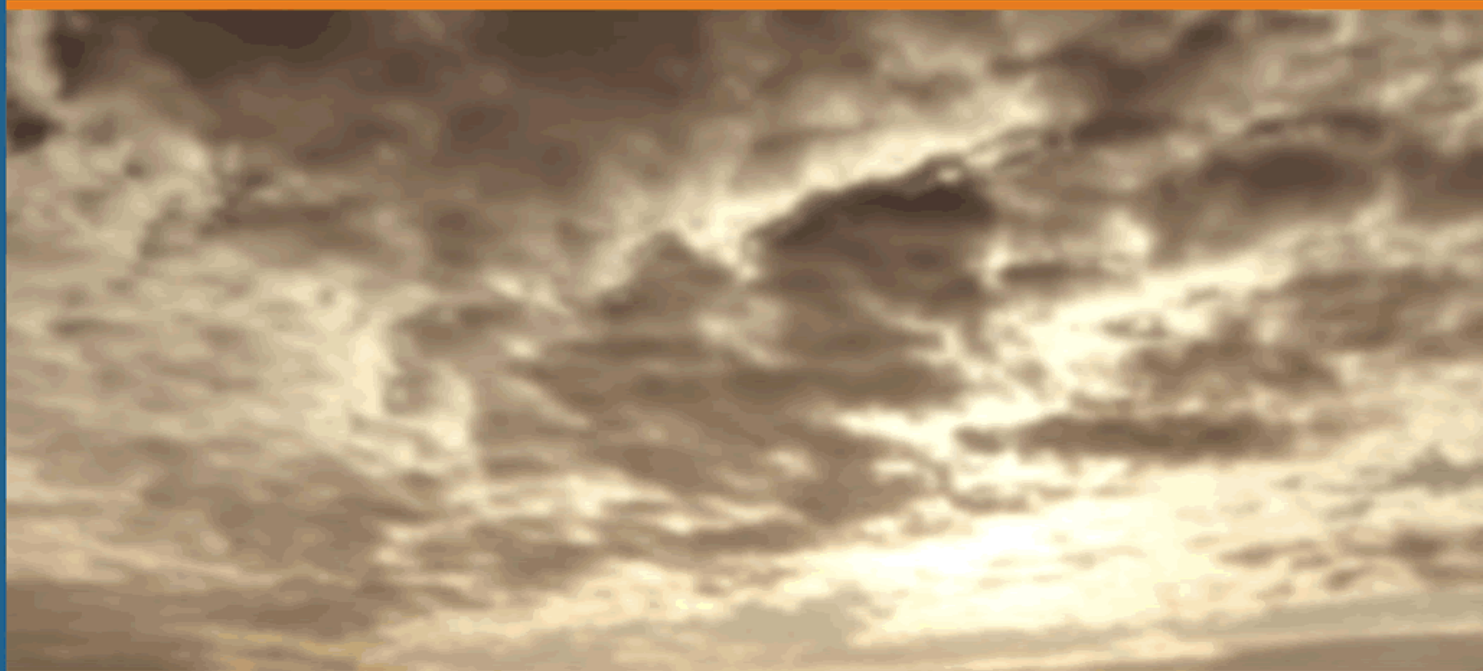


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Varieties of *Cucurbita Maxima* Dutch (*Cucurbitaceae*) in the
Sudano-Sahelian Zone of Cameroon



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Endogenous Knowledge and Production of Potential Local Varieties of *Cucurbita Maxima Dutch (Cucurbitaceae)* in the Sudano-Sahelian Zone of Cameroon.

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Abstract

Purpose: The main concern of this study is to contribute to the availability of data on the endogenous production system of pumpkin in the Sudano-Sahelian zone in Cameroon. The results of this work will undoubtedly allow decision-makers to consider a policy of promoting endogenous knowledge regarding this plant.

Methodology: To achieve this objective, surveys were conducted among 483 people in eighteen villages of six Divisions (Bénoué, Mayo- Louti, Mayo-Rey, Mayo- Kani, Mayo-Danay and Mayo- Tsanaga). The data collected were codified and encoded in the Excel spreadsheet of the Microsoft Office 2019 program. They were then analyzed using SPSS 20 (Statistical Package for Social Sciences) software, the chi-square test (χ^2) for the comparison between percentages and XLSTAT to perform Principal Component Analysis of the variables

Findings: These surveys revealed that the potential *Cucurbita maxima* farmers are women, they represent 78.67 % of producers. Pumpkin is grown in association with other crops including: 56 % with *Arachis hypogaea*, 22 % with *Eleusine coracana*, 10 % with *Zea mays*, 9 % with *Gossypium hirsutum* and only 4 % with other speculations including *Abelmoschus esculentus*. Producers use seeds of local varieties. Derived products such as fruits, seeds, leaves, stem, root and peduncles have high ethnobotanical values. Pumpkin is mainly cultivated for self-consumption and the rest for sale. The fruits are preserved by farmers under the seed beds, around a family watering hole canary for a period ranging from one to three months.

Contribution to Theory, Policy and Practice: The results of this study will allow breeders to exploit these genetic resources in different ways to produce new cultivars and promote the pumpkin sector in Cameroon.

Key words: *Cucurbita Maxima*, Productivity, Pests, Food Security, Sudano- Sahelian.

1. Introduction

The Cucurbitaceae family includes 130 genera and about 800 species. Plants of this variety are mainly cultivated in warm regions. They have a very high economic, nutritional and medicinal values (Ajour & Nmom, 2017). Many species belong to the Cucurbitaceae family, including those of the genera *Cucurbita*, *Cucumis* and *Citrillus* are cultivated for edible purposes. Other species such as the gourd (*Citrullus colocynthis*) and gourd (*Lagenaria siceraria*) which are rich in cucurbitacin, a very bitter and highly medicinal substance (Ozona & Léon- Galván, 2017). The genus *Cucurbita*, which has 18 species, is composed of creeping or climbing plants, all originating from tropical America, of which five species are frequently cultivated in the world, notably *C. maxima* commonly known as pumpkin (Grubben, 2004). Global pumpkin production is increasing steadily from 15,186,469.4 million tonnes in 2020 to 17,992,249.03 million tonnes in 2022. China is the world's largest producer of squash with 7,325,193 tonnes, or 45 % of production, while Algeria is the leading African producer and the 14th in the world with 400,490.25 tonnes (FAOSTAT, 2022). Fruit yields of *C. maxima* vary from 5 to 40 t / ha with an average of 18t / ha; seed yields vary from 300 to 500 kg / ha, depending on the cultivar and cultivation practices (Polacchi *et al.*, 1982). About 80 % of the world's population uses plants in traditional pharmacopoeia (Shafaei *et al.*, 2011). In medicine, pumpkin is used to reduce blood glucose or blood sugar levels in diabetics, and its extract contains anti-inflammatory and antioxidant properties (Salehi *et al.*, 2019). Dietarily, *C. maxima* is a good source of potassium, folic acid, beta-carotene, and vitamins A and C (Gene *et al.*;2010). Although an integral part of indigenous culture in Cameroon (Malzy, 1954 and Westphal *et al.*,1981); its agricultural production seems to be neglected, with a lack of reliable statistical data on the cultivated area and the quantity of annual production. According to the FAO (2017) report, the prevalence rate of households in food insecurity in Cameroon is 15% in the North and 24 % in the far north with a national poverty rate of 37.7 % (INS,2024). The agricultural sector represents the bulk of the Cameroonian economy (Mbondji, 1984 and SDN30). Pumpkin leaves and fruits are highly prized by the local population. Improving the visibility and availability of this genetic resource on local markets at any time could contribute to the fight against food insecurity in Cameroon. To our knowledge, data on *Cucurbita maxima* have been limited to just its botanical description (Westphal *et al.*,1981). However, no study has examined local varieties of pumpkins cultivated by small farmers, nor collected farmers' knowledge of this plant in the Sudano-Sahelian zone of Cameroon. The objective of this work was to characterize the endogenous production systems of *C. maxima* in the sudano-sahelian zone of Cameroon. More specifically, it was a question of carrying out a socio-demographic analysis of the producers, studying the system of cultural practices and the ethnobotanical knowledge of the local varieties of pumpkins grown and finally of assessing the constraints that hinder the pumpkin sector in the Sudano-Sahelian zone of Cameroon.

2. Materials and Methods

2.1. Characterization of the sudano-sahelian zone of Cameroon

The Sudano-Sahelian zone of Cameroon is represented by two regions : the North and the Far North. The capital of the North region is Garoua, this city being also the chief town of Benoue division. It extends between the 8th and 10th degrees of North latitude and between the 12th and 16th degrees of East longitude and is divided into four Divisions namely :-Benoué, Mayo-Rey, Mayo- Louti and Faro (Dumort & Peronne, 1966). This region is characterized by a Sudano-Sahelian climate an annual average temperature of 27°C and rainfall between 1200 and 900 mm decreasing according to latitude from South to North. (MINEPAT, 2012). The vegetation consists of trees, shrubs and Poaceae (Letouzey, 1982). Six types of soils are found in this region, namely: poorly evolved soils, vertisols, hydromorphic soils, tropical ferruginous soils, raw mineral soils and halomorphic planosols (Muller & Gavaud, 1979).

The Far North region, whose capital is Maroua, is located between 10°35' North latitude and 14°20' East longitude (Dumort & Peronne, 1966) with an average altitude of 500 meters. It includes six Divisions namely: Mayo- Kani, Mayo-Danay, Diamaré, Mayo - Tsanaga, Mayo-Sava and Logone-Chari (Morin, 2000). This region belongs to the Sudano-Sahelian zone with an annual rainfall that varies between 400 to 1200 mm and an annual average temperature between 29°C-36°C (Morin, 2000). The vegetation consists of trees, shrubs and Poaceae. (Raunet, 2003). Soils are of six types, namely : poorly evolved soils, vertisols, hydromorphic soils, tropical ferruginous soils, raw mineral soils and halomorphic planosols (Muller & Gavaud, 1979).

2.1.1. Study sites

The study was carried out in the divisions of Bénoué, Mayo- Louti, Mayo-Rey, Mayo- Danay, Mayo- Kani and Mayo- Tsanaga (Fig. 1). In total, eighteen (18) villages spread across twelve (12) districts and six (06) divisions were selected. These villages were selected following a preliminary survey of *Cucurbita maxima* production basins in the Sudano-Sahelian zone of Cameroon.

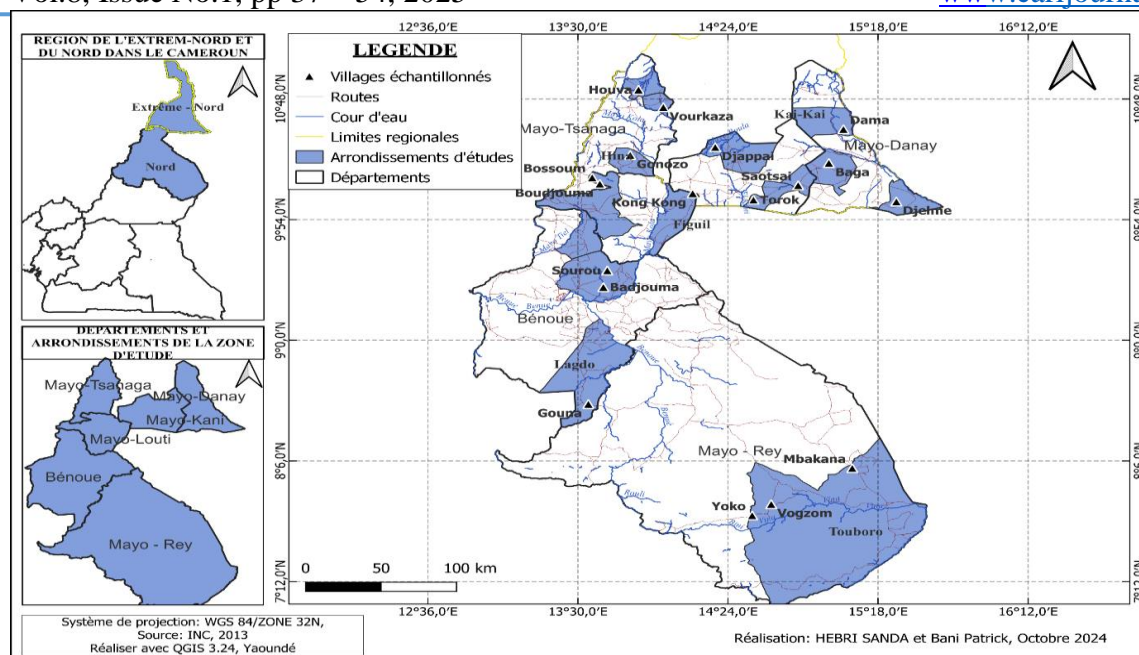


Figure 1 Location map of study areas

2.2. Method

Semi-structured interviews were conducted in six divisions with 483 unequal repair producers in 18 villages. This inequality of distribution is explained by the number of producers who were identified per village during this study. The sample size was determined using Schwartz's (1997) probabilistic method illustrated by the following equation (1):

$$X = \frac{Z^2 \times P(1-P)}{a^2}$$

The sample size (X) for the case of this study was 483 ; with confidence level according to the reduced centered distribution of 95 % in the context of this study from where (Z) = 1.96; (P) : estimated proportion of the population and when it is unknown we use $P = 0.5$ which corresponds to the case of a greater dispersion. A margin of error of precision (a) of 5 %. The questionnaire developed for these surveys was inspired by that of Mary & Besse (1996), carried out as part of the development of agroforestry programs and projects. The questionnaire was structured around 03 types of questions : open questions, which allowed respondents to answer according to their knowledge; closed questions, which were answered yes / no and leading questions, which allowed respondents to choose one or more answers from those proposed to them. The questionnaire covered the socio-demographic characteristics of producers, the characterization of production systems, constraints related to production, yield and the storage system of *Cucurbita maxima*. The following variables were taken into account: gender, main and secondary activities.

2.3. Data analysis

Qualitative variables (gender, local varieties, secondary activities,–socioeconomic values of pumpkin products and farmers' ethnobotanical knowledge of *Cucurbita maxima*) and

quantitative (cropping systems and yield). The statistical data collected in the field was encoded in the Excel spreadsheet of the Microsoft Office 2019 program where some tables and histograms were built. The various analyses were made using the XLSTAT 2019 software. The Tukey test was used for the comparison of means when the p-value was $> 5\%$ and Principal Component Analysis (PCA) of certain variables.

3. Results

3.1. Sociodemographic characteristics of *Cucurbita maxima* producers

3.1.1. Distribution of producers by genre

In total, 305 producers were identified in the Northern region. The Benue division has the largest number of producers, with 158, followed by Mayo- Louti and Mayo-Rey, which have 92 and 55 producers respectively. In this region, the vast majority of producers are women, representing 81.87 % of producers, compared to 18.12 % of male producers. Regarding male producers, the Mayo Louti division has the largest number of producers (18.48 %), followed by Mayo-Rey (18.18 %) and Benoue (17.72 %). Regarding female producers, Benue has the largest number (82.28 %) followed by Mayo-Rey and Mayo- Louti with 81.82 % and 81.52 % of female producers respectively.

In the Far North region, 178 producers were identified, 78 in Mayo- Danay, 51 in Mayo- Kani and 49 in Mayo- Tsanaga (Table 1). As in the North region, the vast majority of producers are women (63.27% of the total number of the producers). Regarding male producers, the Mayo- Tsanaga division records the highest number of producers in terms of frequency, 36.73% of whom are female producers, followed by Mayo- Danay and Mayo- Kani, which have (26.92 %) and (17.65 %) of whom are female producers, respectively. Regarding female producers, Mayo- Kani records the highest number, 82.35 % of whom are female producers, followed by Mayo- Danay and Mayo- Tsanaga with (73.08 %) and (63.27 %) of whom are female producers, respectively. Comparison between the numbers of female and male producers reveals a significant difference overall ($t = 20$; $ddl=16$; $p\text{-value}=0,220$) at the 5% significance level. The distribution of producers according to the genus of *Cucurbita maxima* in the sudano-sahelian zone of Cameroon is illustrated in Table I.

Table I. Distribution of peasants by gender

Régions		North						Far-North						Total for two Regions				
Departments	Benue		Mayo – Louti		Mayo – Rey		Total		Mayo-Danay		Mayo –Kani		Mayo-Tsanaga		Total		n	f (%)
	Genre	n	f (%)	n	f (%)	n	f (%)	N	f (%)	N	f (%)	N	f (%)	n	f (%)	n		
Men	28	17,72	17	18,48	10	18,18	55	18,03	21	26,92	9	17,65	18	36,73	48	26,97	103	21,33
Women	130	82,28	75	81,52	45	81,82	250	81,97	57	73,08	42	82,35	31	63,27	130	73,03	380	78,67
Total	158	100,00	92	100,00	55	100,00	305	100,00	78	100,00	51	100,00	49	100,00	178	100,00	483	100,00

Student test ($t = 20$; $ddl=16$; $p\text{-value} = 0,220$); f : relative frequency of producers

3.1.2. Principal Component Analysis of Secondary Activities of Producers in the Sudano-Sahelian Zone of Cameroon

The Principal Component Analysis (PCA) of the variables (breeding, fishing, trade, hunting and traditional medicine) and the observations (Departments) shows that 96.16 % of the information is carried by the F1 and F2 axes (figure 1). The different variables are located on either side of the F1 and F2 axis. Livestock farming is the most developed activity after agriculture in the Northern region (Benoue, Mayo-Rey and Mayo- Louti) and there is a strong similarity between producers in this region. While, in the Far North (Mayo - Danay and Mayo-Tsanaga), fishing, hunting, traditional medicine and trade are secondary activities of *Cucurbita maxima* producers. Trade is the most practiced secondary activity after agriculture according to the results of the surveys in 03 divisions of the Far North regions. However, in Mayo- Kani livestock farming is more developed compared to trade. Hunting is more practiced by producers in the Mayo- Tsanaga Division compared to Mayo - Danay along axis F1. The hunting variable is correlated to the first dimension with a correlation coefficient of 1. Livestock farming and trade are the most dominant secondary activities in the sudano-sahelian zone of Cameroon.

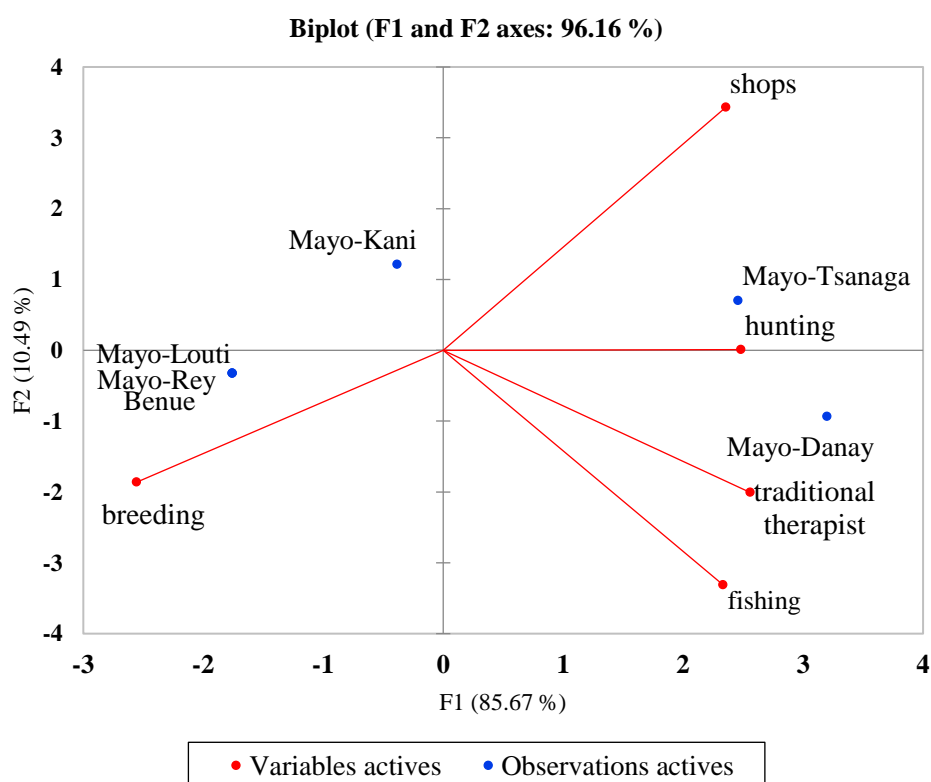


Figure 2: Other activities practiced by farmers in the sudano-sahelian zone

3.2. Studies of cultural practices and ethnobotanical knowledge on local varieties of pumpkins

3.2.1. Information on the endogenous production of *Cucurbita maxima*

According to the survey data, pumpkin is grown in association with other types of crops by producers in the sudano-sahelian zone. Pumpkin is sown around termite mounds by the farmers

surveyed, i.e. approximately 3 to 4 pockets per termite mound depending on the size of the latter. The different types of association of crops with *C. maxima* in the sudano-sahelian zone in Cameroon are shown in Figure 2 below. Producers in the Sudano-Sahelian zone associate pumpkin cultivation with the *Arachis field hypogaea* (56 %), *Eleusine coracana* is (22 %), *Zea mays* 10 %, cotton 9 % and only 3 % with other types of crops.

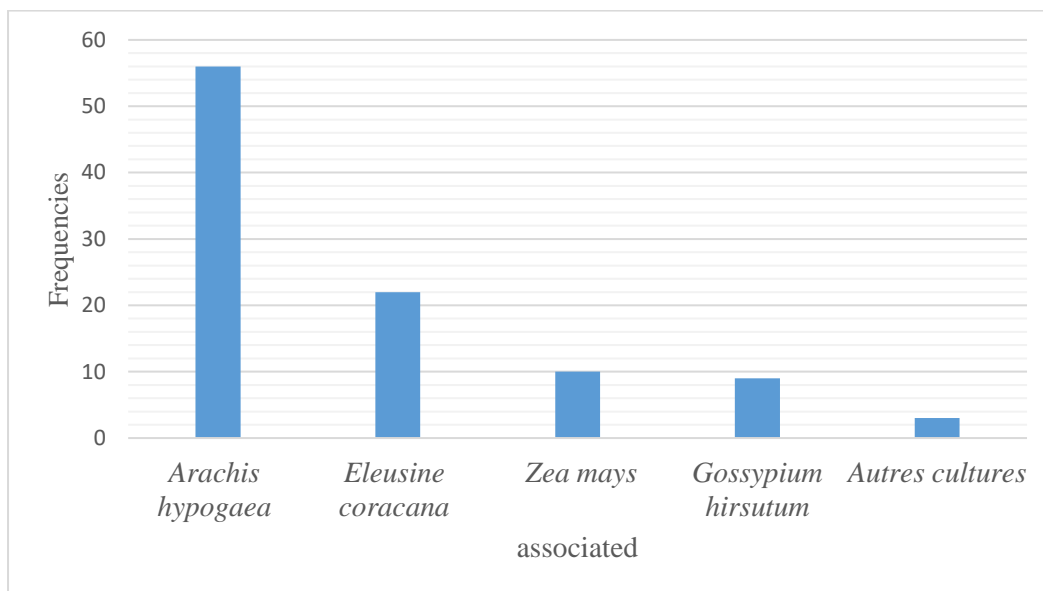


Figure 3: Types of crops in association with *Cucurbita maxima*

The cultural associations between pumpkins and other crops are illustrated in Figures 3 and 4 below.

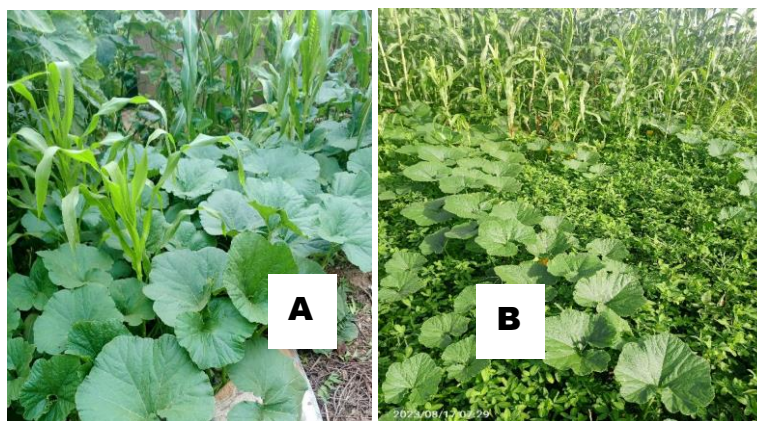


Fig. 3: *Cucurbita maxima* in association with *Zea mays* and *Abelmoschus esculentus* and **B** : *Cucurbita maxima* in association with *Arachis hypogaea* and *Eleusine coracana*

A: *Cucurbita maxima* in association with *Zea mays* and *Abelmoschus esculentus* and **B** : *Cucurbita maxima* in association with *Arachis hypogaea* and *Eleusine coracana*

3.2.2. Local varieties of pumpkin most cultivated in the sudano-sahelian zone of Cameroon

The data from this study made it possible to identify potential local pumpkin varieties. During this study, it was found that the name of the varieties depends from one ethnic group to another and from one locality to another. Overall, three varieties of *Cucurbita maxima* were identified.

In general, producers in the Sudano-Sahelian zone prefer the variety called “Blue-Hungary” or by 47.62 % of producers followed by the variety “dark green” and cream yellow respectively by (32.92 %) and (19.46 %) of producers. Depending on the Divisions, the farmers of (Bénoué, Mayo- Louti , Mayo- Rey MayoKani and Mayo - Tsanaga) appreciate the “ Blue-Hungary” variety while in Mayo - Danay it is the Dark Green variety that dominates (37.2). The potential varieties of *Cucurbita maxima* encountered in the sudano-sahelian zone in Cameroon are illustrated in Table II.

Table II. Local varieties of *Cucurbita maxima*

, *f* (%) : relative frequency of producers

Departments ^{Benue}													Total for six Department	
	Mayo-Louti		Mayo- Rey		Mayo-Danay		Mayo-Kani		Mayo-Tsanaga		n	f (%)		
Variétés	n	f (%)	n	f (%)	n	f (%)	n	f (%)	n	f (%)	n	f (%)	n	f (%)
Yellow	29	18	20	21,74	11	20	23	29,5	4	7,84	7	14	94	19,46
Blue-Hungary	80	51	41	44,57	29	52,7	26	33,3	27	52,94	27	55	230	47,62
Dark greens	49	31	31	33,7	15	27,3	29	37,2	20	39,22	15	31	159	32,92
Total	158	100	92	100	55	100	78	100	51	100	49	100	483	100,00



Figure 5: Potential local varieties of *Cucurbita maxima* in the sudano-sahelian zone in Cameroon

Caption: **A**: “Dark green” and oval pumpkin; **B**: “Hungarian blue” pumpkin

C: Yellow pumpkin

3.2.3. Principal Component Analysis on the Use of Pumpkin Derived Products

Pumpkin products are of great importance and ethnobotanically diversified, the fruits of which are highly consumed in puree, soup, raw or steamed by the majority of the populations of the sudano-sahelian zone. The grains are prepared as a pumpkin dish which is prized by the populations and in addition to being used as a ritual symbol during the harvest festival called “toupti kousou” among the Fali people.

The Principal Component Analysis (PCA) of the variables (fruits, leaves, seeds and peduncle/stems) and the observations (Departments) shows that 86.33 % of the information is carried by the F1 and F2 axes (figure). The different variables are located on either side of the F1 and F2 axis. Pumpkin leaf consumption is higher in Mayo- Tsanaga and Mayo -Danay. Regarding fruit consumption, it is higher in Mayo – Rey and Mayo – Louti. The peduncles and stems/roots are highly used in traditional medicine and potash production by the natives in Benoue. While the seeds are highly edible in pumpkin dishes in Mayo- Kani. In summary, the fruits, seeds and leaves are highly edible. While the peduncles and stems/roots are part of the tricks used for the treatment of certain diseases by the populations in the sudano-sahelian zone.

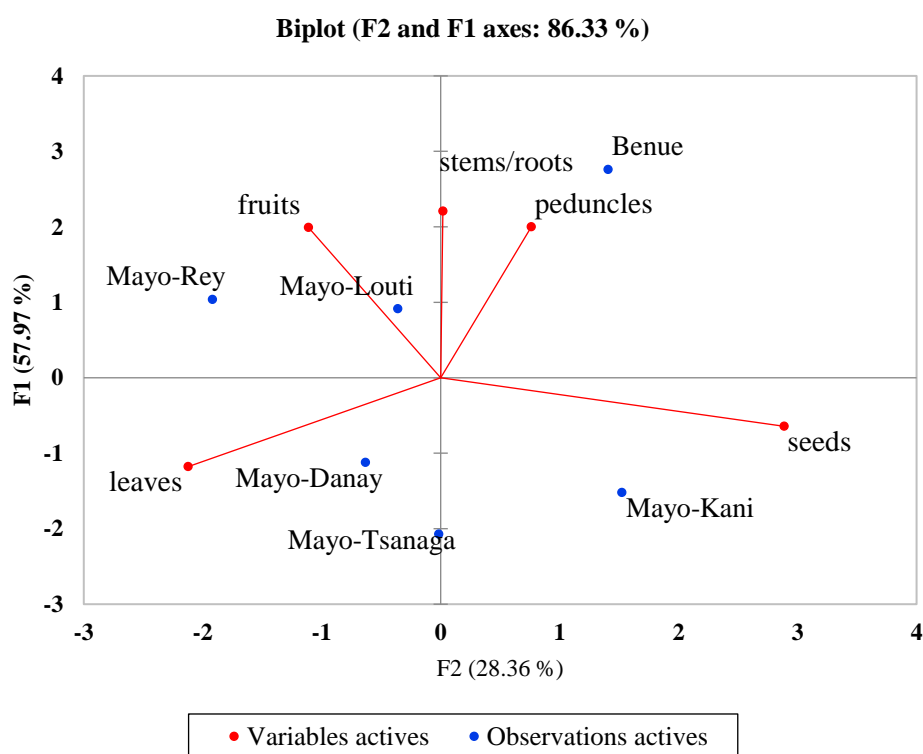


Figure 6: Principal Component Analysis of *Cucurbita maxima* derivative product values

3.3. Socioeconomic importance and storage techniques of pumpkin fruits

3.3.1. Socioeconomic importance

During this study, reliable information on yield was not provided given that pumpkin cultivation is mainly for self-consumption by producers. The information that was obtained was based on real motivations that farmers have for pumpkin cultivation. Regarding the sale of pumpkin fruits, overall farmers store part of their harvest to sell and/or consume in post-harvest periods.

The need to satisfy food self-sufficiency or self-consumption of pumpkin is very high in Mayo-Louti and Benue with 76.08 % and 74.05 % of producers respectively. However, 45.45 %, 25.94 % and 23.91 % of farmers respectively in Mayo-Rey, Benoue, Mayo- Louti make this crop their source of economic income. Pumpkin producers in the Northern region specialize either for commercial production or for family self-consumption but in no case for both reasons.

While in the Far North, the need for self-consumption of pumpkin is highest in Mayo- Danay with (71.79 %) producers followed by Mayo- Kani and Mayo- Tsanaga with respectively (64 %) and (63.26 %) producers. However, production exclusively for sale is very low in general with a workforce of producers respectively, (12 %) in Mayo- Kani, (10.2 %) in Mayo -Tsanaga and (3.84 %) in Mayo- Danay. In addition, pumpkin cultivation for self-consumption and sale is of the order of (26.53 %) in Mayo- Tsanaga, (24.35 %) in Mayo- Danay and (24 %) in Mayo- Kani of producers. In all six departments of the sudano-sahelian zone surveyed, 69.7 % of producers practice this speculation mainly for self-consumption. On the other hand, this crop constitutes a major source of income for 21.17 % of producers in the sudano-sahelian zone in Cameroon. Finally, 9.12 % of producers cultivate this speculation both for self-consumption/sale. The socio-economic importance of *Cucurbita maxima* in the Sudano-Sahelian zone of Cameroon is illustrated by figures (7; 8 and 9) below

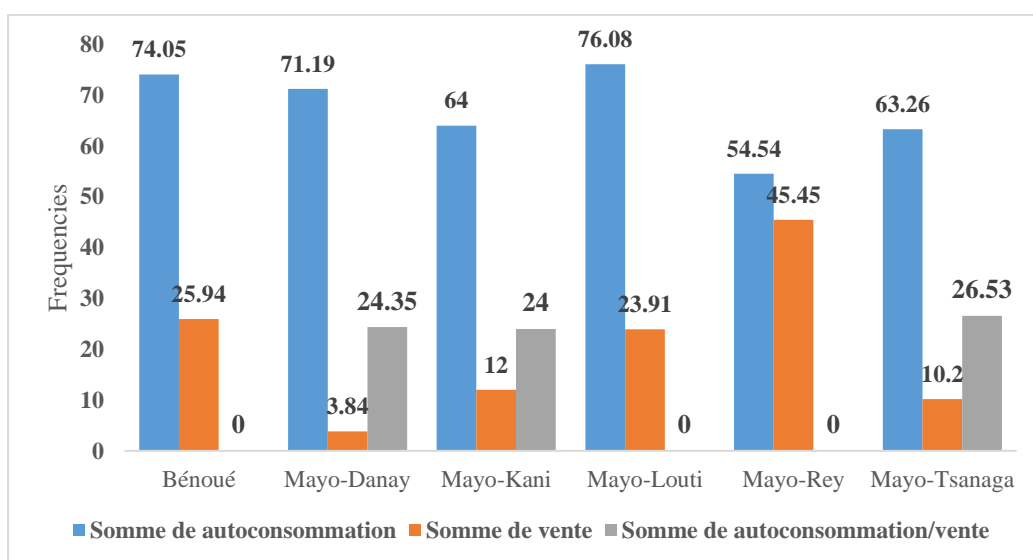


Figure 7: Socioeconomic importance of products derived from *Cucurbita maxima*



Figure 8 : Squash sale on the Garoua – Maroua road

3.3.2. Techniques for pumpkin fruits storage

It was found during the surveys that the fruits of *C. maxima* are stored either fresh or dry by farmers who obtain high yields. The storage technique is done under the seed trees and around the canaries of the family water point for a period ranging from one to three months by 70 % of the producers surveyed (Figure 10). In addition, 30 % of the producers peel the fruits and dry them then pack them with millet leaves in order to store this commodity (Figure 11).



Figure 9 : Storage fruits around a family water point



Figure 10 : Storage system for dried *Cucurbita maxima* fruits

3.4. Pumpkin crop pests in the sudano-sahelian zone in Cameroon.

It emerges from this work that one of the major constraints of pumpkin cultivation is the marketing of fruits which is difficult according to the results of surveys with producers. In addition, pumpkin cultivation is confronted by several threats including mainly phytophages and rodents which have an influence on the optimal fruit yield. In the eighteen villages surveyed, the information on the constraints which hinder the cultivation of *Cucurbita maxima* is the same. These attacks are mainly linked to the frugivorous activity of rodents, Orthoptera and to the bites of insects of the Tephritidae family whose extent of damage is illustrated by figures 12 to 13 below.



Figure 11: Fruit infested by flies (Hebri.2022)



Caption: **A:** Cucurbita maxima plants ravaged by Orthoptera, **B:** gnawed pumpkin fruit

4. Discussion

4.1. Sociodemographic characteristics of *Cucurbita maxima* producers

Pumpkin or *Cucurbita maxima* is mainly cultivated by women in the sudano-sahelian zone of Cameroon, 78.67 % compared to 21.33 % of men of the producers surveyed. Agriculture in general and pumpkin cultivation in particular is mainly practiced by women on a small scale and in association with other types of cultivation in the sudano-sahelian zone of Cameroon. Basu *et al.*, (2012) and OUOBA *et al.*, (2016) reported the same results on voandzou producers (*Vigna subterranea*), in sub-saharan Africa and *Cucurbita moschata* dominated by women in association with other crops such as groundnut (*Arachys hypogaea*). The small area and its practice in association with other crops would be due in part to access to land which is limited to women, the lack of markets to sell pumpkin products; insufficient policy to popularize this crop. 40 % of the men surveyed said they were very interested in pumpkin cultivation but were worried about the problem of marketing the fruit which is often difficult due to the lack of buyers and a market. These results are similar to those of Oswell *et al.*, (2007) who conducted a study on the endogenous knowledge of *Cucurbita maxima* producers in Zimbabwe, 52.5 % of producers highlighted the difficulty related to the marketing of this commodity caused by the problem of transport.

4.2. Studies of cultural practices and ethnobotanical knowledge on local varieties of pumpkins

Pumpkin production in the sudano-sahelian zone of Cameroon is based on seeds of local varieties cultivated and preserved for several generations by farmers for long periods. The results of this study corroborate those of Gwanama *et al.*, (2000) and Chigwe & Saka, (1994) whose work was conducted in southern Africa for the same circumstance. Three major varieties of pumpkin have been identified in the Sudano-Sahelian zone of Cameroon whose names vary from one locality to another and from one dialect to another. The choice of varieties by producers is based on organoleptic criteria (taste, size of fruits, thickness of the rind or the

quality of its leaves) and resistance to phytophagous insects; the same selection criteria were reported by Gwanama *et al.*, (2000), Chigwe & Saka, (1994) in southern Africa. The variety "Blue of Hungary" seems to be the one that contains all the criteria of choice for consumption (floury, sweet but average fruit) by the farmers of six Divisions studied in general and particularly in the Benue, Mayo- Louti, Mayo-Rey, Mayo- Tsanaga and Mayo- Kani divisions. While the producers of Mayo- Danay prefer the dark green variety, which gives large fruits less floury and slightly salty. In addition to this organoleptic criterion, we have the variety called " Toupti Kousou " which is cultivated for ritual needs during the harvest festival among the Fali people. The collection of endogenous knowledge and the conservation of the different local varieties identified would be very important for the selection and improvement of pumpkins in Cameroon. The main reason for the production of this crop in intercropping was on the one hand, the reduction of labor, the maximization of land exploitation and agricultural production. The results of this study are similar to those of Schippers, (2000) and Oswell *et al.*, (2007) who pointed out that the association allows more efficient use of land, labor and fertilizers than growing them separately. In addition, the results of our investigations indicate that the cultivation of *C. maxima* is associated with *Arachis hypogaea* (56 %), *Eleusine coracana* (22 %), *Zea mays* (10 %), *Gossypium hirsutum* (9 %) and only 3 % with other crop types. The practice of growing this crop in association with other crop types suggests rapid growth and an ability to withstand some degree of shading. Furthermore, in Zimbabwe Mashingaidze *et al.*, (2000) mentioned that the association of pumpkin/corn cultivation reduces the frequency of weeding and hinders the growth of weeds compared to corn alone. The three sister's agricultural technique has been observed in some indigenous communities in North and Central America. Indeed, this method of cultural practice is part of the agroecological and sustainable development spirit according to the work of Carlson, (2005) and Pardo, (2009). Pumpkin is sown around termite mounds at a rate of two to four pockets per termite mound depending on the size of the latter by producers in the Sudano-Sahelian zone of Cameroon. Deepa *et al.*, (2018) report that the termite mound contour is made up of large quantities of organic matter and a soil pH between 6.5 and 7.5 which are favorable for maximum pumpkin production which could explain the choice of sowing this crop around termite mounds in the Sudano-Sahelian zone of Cameroon.

Some farmers dried their pumpkin leaves for later use. Thus, the cultivars " Ndoda " and " Dotimango " were reported by farmers as those that produced good edible leaves in the Sudano-Sahelian zone. On the other hand, Van der Mheen *et al.*, (1997) reported that 2 to 3 leaves are harvested per plant without distinction of varieties or cultivars.

4.3. Socioeconomic importance and storage techniques of pumpkin fruits

Many farmers stored pumpkin fruits whole, with the stalk, under the seed shed and around the canaries of the family water point for a period ranging from 1 to 4 months. However, similar work was conducted in Zimbabwe by Ndoro *et al.*, (2007) who reported that pumpkin fruits are stored under the sheds for a period ranging from 2 to 6 months. The difference in the storage period would be due to the varieties of seeds and/or climatic factors, or even the choice of the storage location. The removal of the stalks considerably reduces the storage period of pumpkin

fruits. The criterion for choosing these locations could be justified by their relatively low and humid temperatures which meet the standards for fruit storage.

The main reason for pumpkin production in the Sudano-Sahelian zone is essentially to meet the need for food self-sufficiency, of which 70 % of the total production is devoted to this purpose. And 21.17 % of the production is intended for sale. The populations consume pumpkin fruits 3 to 6 times a week during the rainy season. Furthermore, similar surveys conducted in Zimbabwe by Van der Mheen *et al.*, (1997) revealed that the fruits are consumed 3 to 9 times a week by the inhabitants during the rainy season. These data suggest that the consumption of pumpkin fruits and/or leaves is part of the eating habits of populations in the Sudano-Sahelian zone in Cameroon and the popularization of the cultivation of this crop would be one of the solutions to combat food insecurity. It would contribute to increasing the major components

in the structural transformation of the Cameroonian economy (SDN30). Pumpkin cultivation is not too demanding in chemical input and is highly productive. Among the challenges of sustainable development, we have the protection of the environment and the eradication of poverty; therefore, pumpkin cultivation would be one of the solutions for agricultural and food resilience in order to mitigate the phenomenon of climate change (FAO, 2008).

Conclusion

Knowledge about the endogenous production system of *Cucurbita maxima* was achieved through surveys of pumpkin producers. Although pumpkin products are highly appreciated by the populations, it is still cultivated in association with other crops such as *Arachis hypogaea*, *Eleusine coracana*, *Zea mays*, *Gossypium hirsutum*. Women are the main potential producers of *Cucurbita maxima* in the sudano-sahelian zone of Cameroon, with 78.67 % compared to 21.33 % for men. Pumpkin is mainly grown for family self-consumption and represents a little over 70 % of production. Farmers use local variety seeds. Pumpkin products such as roots and stems are used in traditional medicine, and farmers display the fruits along the main roads for marketing. The results of this study will allow breeders to exploit these genetic resources in different ways to produce new cultivars and promote the pumpkin sector in Cameroon.

Recommendation : To include the squash sector within the framework of the National Project for the Monitoring and Strengthening of Food Security (PNVRSA), under the supervision of the Ministry of Agriculture and Rural Development (MINADER).

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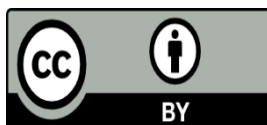
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